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WINCHESTER COLLEGE AND ITS LIBRARY.

[The view exhibits the Cloisters, the entrance to the Library, and the tower of the Church.]

If antiquity has any influence in warming the imaginations of the young, making them feel that the ground upon which they tread is classic, and has been the abode of the learned for ages and centuries, there is no question that St. Mary's College, not unfrequently styled, from its great renovator, Wykeham's College, at Winchester, has a prior claim, in this respect, to any other seminary of learning in the British dominions. The Romans, there is no doubt, formed here an establishment for education in their own literature and religion, and it is said to have occupied the site of the present College. Under the Saxons, Winchester, though probably without an actual College, was still celebrated as a place for instruction. Ethelwald selected Swithin (St. Swithin), bishop of Winchester, as tutor for his favourite son Alfred, who afterwards became so celebrated as a monarch, and attained no mean name among the literati of the time. This is one source of pride to a young Wykehamist even at the present time, and it is a noble pride leading to patriotism, that he treads the same ground and receives his early education where the best and greatest of the Anglo-Saxon kings, the founder of the British navy, received the rudiments of instruction in his infant years.

After Alfred had finally routed the Danes, and onward during the reigns of all the Anglo-Saxon kings down to the reign of Ethelred, whose imbecility again gave boldness to these northern invaders, the school at Winchester appears to have gone on with its usual success; and, at or before this time, sacred architecture, a talent for which first brought Wykeham into notice, appears to have been cultivated with no ordinary assiduity. One of the most conspicuous scholars that it furnished during the tenth century appears to have been Ethelwald, who was first a monk in Winchester, then abbot of Glastonbury, and ultimately bishop of Winchester. He was a native of this city, and appears to have received the whole of his education at its school, and he afterwards became celebrated for architecture, and for various branches of what now would be termed civil engineering. At the command of King Edred and his

mother Elgiva, he planned and superintended the building of the monastery of Abingdon; and his talents were called into requisition at the cathedrals of Ely and Peterborough, and at sacred buildings at various other places. He also rebuilt the cathedral of Winchester; the crypts which remain under the eastern part of the building are understood to be from his designs and executed under his superintendence; and they are among the most perfect and best preserved specimens of the higher class of sacred architecture among the Anglo-Saxons which are to be met with in England. He is also understood to have contrived and executed the division of the single stream of the Itchen into a number of channels, by which means streams of the purest water were brought along many of the streets, and the inhabitants abundantly supplied with that very essential article. The conduct of this Anglo-Saxon prelate is of some importance, as throwing light upon at least some of the studies which were pursued in its schools, which in those days appear always to have been attached to cathedrals and wealthy monasteries, and of which the teachers appear to have been invariably churchmen. That sacred architecture should have been taught in such establishments is what we might naturally suppose; but when we find a student of the school at Winchester projecting, planning, and carrying into effect a means of supplying the inhabitants of the city generally with water, the bent and purpose of some of the studies at least assume a more high and valuable character than many are apt to suppose; for it lets us see that the schools of those times were at least as forward in proportion to the spirit of the age as those of the present day.

Notwithstanding the Danish conquest, if conquest it could be called, the disturbances of the kingdom toward the close of the Saxon dynasty, and the rather questionable sanctity of some of the prelates, there was no falling off when William of Normandy acquired the English crown; and the accession of that monarch, which is known to have given a great impulse to learning all over the country, must have had fully as much influence at Winchester as anywhere else. It was probably owing to the spirit for education which the Norman princes were so anxious to introduce, that the character of the school at Winchester appears to have undergone a considerable change, by being made a general grammar-school for all classes of the people, poor as well as rich. Of this we have evidence in the fact, that when Henry de Blois founded the hospital of St. Cross, just sixty-six years after the Conquest, he directed that, of the hundred poor men who were to be furnished with dinner every day at that institution, thirteen should be "of the poorer scholars of the Great Grammar-school in Winchester, to be selected by the masters."

This statute by De Blois, in the establishment of his hospital, was made 243 years before Wykeham took the grammar-school under his immediate protection, and 257 years previous to the completion of the building for the establishment as new modelled by him. Down to the time when he purchased the grounds of the prior and convent of the cathedral, which answered in Catholic times to what are now the dean and chapter, it does not appear that the school was endowed with any property; and as little does it appear that there was any provision for the master until Wykeham took the management of the school in 1373. It appears to have been part and parcel of the general property and establishment of the prior and convent; though the above-mentioned fact shows that it was directed to other than monastic purposes, and that, in all probability, it fluctuated a little, along with the varying dispositions of those who, for the time, had the management there. But as we may presume that the majority of the monks belonging to this priory were educated at this school, it is natural to suppose that they would display considerable zeal in keeping up the character of a seminary in which their own honour and pride were not a little concerned.

We shall suppose, and indeed it is not supposition but well authenticated fact, that William of Wykeham was among the last of the very illustrious scholars who received their early education in "The Great Grammar-school in Winchester." It reflects the more honour on Wykeham that he was of humble parentage. It has sometimes been said that his original name was not Wykeham, but that his father was John Lang, and his mother Sibil, both of them little above the class of labourers, and that he called himself after the place of his birth, after he had got so advanced in the world as to honour it by so doing. That such was the station of life of his parents there is no reason to doubt; but that he should have changed his name is not in accordance with the character of the man. Be that as it may, his intelligence and superior manners attracted the attention of Nicholas Uvedale, lord of the manor, who sent him to the school at Winchester, and, after he had completed the course of study there for six years, to the College at Oxford. It is probably from the circumstance of his juvenile manners having attracted the attention and patronage of this gentleman, and thus laid the foundation of his future greatness, that Wykeham chose for his motto the adage, "*Manners makyth man.*"*

It does not appear that in the early part of his life Wykeham was in any way intended for the church. But after he had been the six years at Oxford, Uvedale, his patron, who had become constable of Winchester Castle, sent for him to act as his secretary. While he was in this capacity, William of Edington, bishop of Winchester, and treasurer and chancellor to Edward III., saw and admired the ingenuity of young Wykeham. While Wykeham was in the service of the bishop, King Edward visited Winchester, and having been informed of the talents of the young architect, appointed him by patent surveyor of the royal buildings, in which capacity he had charge of castles at Dover, Queenborough, Windsor, and other places, and at Windsor in particular, there is one tower—the same which was occupied by Sir Jeffery Wyatville, while conducting the last renovation of the castle—which is called Wykeham tower.

After various changes of fortune, all of them steps of advancement, Wykeham became bishop of Winchester on the demise of his former patron Edington. This happened in the year 1366; and seven years after this, in 1373, Wykeham took the grammar-school into his own hands, chose Robert de Herton for master, paid the master's salary out of his own private funds, and also found board and lodging for the scholars in different houses in St. John's parish. It was well however for the future existence of this most antient seminary of learning, that Wykeham took this first step of purchasing the management, and fourteen years afterwards, after he had had experience of this, followed it up by also purchasing the ground, erecting new buildings, and endowing the foundation with estates that have ever since made it perfectly independent. Had Wykeham not done this, and had the "great grammar-school" remained an appendage to the cathedral priory, there is not the least question that when Henry VIII. saw fit to seize the properties of the monasteries for his own gratification and that of his courtiers, the "great grammar-school" of Winchester, at which so many eminent men of modern times have received their education, would have gone to oblivion along with many other monastic schools of which not even the names now remain.

The object of Wykeham in the purchase, new modelling, and endowment of this school, must be allowed to have been a laudable one. He had just endowed at Ox-

* This expression is not ungrammatical. *Manners, riches, goods*, were used as singular nouns in much later times, and with strict reference to their etymology.

ford, the other place of his education, a College for the special benefit of his diocese; and he wished that natives of the diocese, especially those of the city in which the diocesan cathedral was situated, should have the means of obtaining that preliminary education which should qualify them for deriving the necessary advantage from the College at Oxford; and therefore he established the Winchester school, where a certain number of young men should receive board and education gratis, but without excluding others who were willing and could afford to pay. The last however formed no part of the regular establishment, and at present they are not under the direction of the warden of the College, but that of the head master.

[To be continued.]

MEANS OF PERSONAL AND EPISTOLARY INTERCOURSE SEVENTY YEARS AGO.

The history of the post-office is, in many respects, the history of civilization. It cannot, for instance, have any existence until persons are at liberty to go where they please; and it cannot become a truly national establishment until the great body of the people are taught the rudiments of common learning.

In the Anglo-Saxon times, large numbers of our ancestors were as much fixed to the soil as the trees that were planted on it. Even towards the close of the fourteenth century, when the commons were rising in social importance, it was ordained by statute that "no servant or labourer, be he man or woman, shall depart at the end of his term out of the hundred where he is dwelling, to serve or dwell elsewhere." Three centuries afterwards, when the serfs of former times had become free men, the same system of coercion was applied to paupers and destitute persons. They were forbidden to seek employment out of their respective parishes; and this prohibition, which was enforced by pains and penalties, continued in full operation for one hundred and thirty-three years, when it was somewhat relaxed. But it is only within the last five years that the restraint has been wholly removed, and the disposition which it created in the minds of many of the labouring classes will for some time to come exercise its influence upon their habits.

When people live and die without removing from the place where they were born,—when their kindred and connections are scarcely more than a few miles remote,—when the longest journeys extend only to the nearest town, the intercourse of society is evidently not of such a nature as to need such an institution as the post-office, even if people had acquired the art of reading and writing. When persons of rank began to feel the want of a general medium of communication, their correspondence was forwarded by their own special messengers. The establishment of the post-office arose out of the increased activity of epistolary intercourse; and the period when such an institution was required does not date earlier than the sixteenth century.

In the present day, the necessity of a frequent and rapid communication by post is an imperious want. England is no longer exclusively an agricultural country. Thousands leave their father's house at an early age, and pass their lives at a distance from their family connections. A stream of immigration is constantly pouring into England from Ireland and Scotland. In one year, above a hundred thousand persons have emigrated to the British colonies or to the United States of America. The influence of the law of settlement is greatly diminished, and men of the humblest ranks look round to discover how they shall best advance their interests, and no longer despair because the narrow bounds of their native parish do not afford them employment. The excavators employed in the formation of a railway will talk of going to Belgium or some other part of the Continent when they have completed their present contract; and the agricultural labourer, with his scythe at his back, may be seen on board a steam-boat in the Thames, bound for Yorkshire; the low fare of half-a-crown enabling him, after having worked at the most profitable description of agricultural labour as long as it could be obtained in the southern counties, to proceed to the opposite extremity of England in search of similar employment. Upon persons of this class, who are frequently absent from their families for several weeks, the penny post will confer great obligations when they shall have learned to avail themselves of it. Objections may be made to these migrations, but if employment is not to be obtained at home, it is better to go even to some distance, where it is to be had, than be dependent upon the parish. The migration of labourers was permitted by the law passed in 1351, called the 'Statute of Labourers.' Those who resided in the upland districts, where the harvest was late, were allowed to leave their hundred and assist in getting in the harvest in the plains, where it was ready for the sickle much earlier.

Seventy years ago, a young man who came up from Cumberland or Northumberland to make his fortune in London would perhaps not visit the scene of his early life until years had elapsed, and the love of friends, if not of kindred, had become dimmed. Travelling was not only expensive, but the fatigue and loss of time consequent upon a long journey were serious obstacles to locomotion. That frequency of personal intercourse which multiplies the occasions for epistolary communication did not exist to anything like the extent which is possible at this day. By the railroad, a man can now leave London at half-past eight at night, and at seven in the morning he may breakfast at Preston, 221 miles from the metropolis. The motion of the railway train is so easy that there is nothing to prevent a traveller sleeping through the night. There is not any one of the remarkable improvements of the last thirty years which would have astonished men of the last generation so much as this marvellous fact. The unrivalled perfection to which travelling by mail and stage coaches was carried before railroads were formed would have scarcely appeared less miraculous. Our grandfathers thought they were "going a-head" at the time when the following announcement was made in a work published in 1768:*—"There is of late an admirable commodiousness both for men and women of better quality to travel from London to almost any town of England, and to almost all the villages near this great city, and that is by stage-coaches, wherein we may be transported to any place, sheltered from foul weather and foul ways; and this not only at a low price, at about a shilling for every five miles, but with such speed as that the posts in some foreign countries make not more miles in a day; for the stage-coaches, called 'flying-coaches,' make fifty or sixty miles in a day, as from London to Oxford or Cambridge; sometimes seventy, eighty, or a hundred miles, as to Southampton, Bury, and Norwich."

Our grandfathers moreover were content if the post conveyed their correspondence to and from London twice or thrice a-week; but now, by the recent establishment of morning mails, letters are sent to most parts of the country twice a-day, or twelve times a-week. Thus, a letter from Brighton, addressed to a person in Yorkshire, is not delayed fourteen hours in London, but is hurried on to its destination two or three hours after it reaches the General Post-office. A merchant at Liverpool also receives the letters which arrive every morning in London by the foreign mails without that injurious delay which took place only two years ago. The change necessarily arose out of the accelerated speed of railway conveyance, which rendered delays formerly little thought of appear monstrous. When the mail-coach was twenty-four hours in travelling from London to Liverpool, a delay of fifteen hours in London was but little more than one-half the

* 'Magnæ Brit. Notitiæ.'

time occupied by the journey; but when the same distance came to be performed in about nine hours, then the disproportion appeared so great as to require an immediate alteration; and therefore letters, instead of lying in the General Post-office all day, are despatched by the morning mails, and reach places above two hundred miles distant from London before the hour at which they would formerly have been sent off by the night mails. The morning mails are of course available to as well as from London.

Seventy years ago, as we have already stated, the communication by post with the principal towns of England was only twice or three times a-week, and with many places not so frequently. Saturday was the great post-day, mails being on that day made up for all parts of England, Scotland, and Ireland; but "the post goes every day to those places where the court resides, as also to the several stations and rendezvous of His Majesty's fleet, as the Downs and Spithead; and to Tunbridge during the season for drinking the waters."* The post-office has now become the most democratic of all our public establishments. It admits all on the most perfect equality; and even the sovereign abandons the privileges of the royal prerogative, and is on a level with the subject. In the olden time, if we may apply that term to a period almost within the recollection of old persons, the post went out daily to the place where the fashionables of the last century were accustomed to resort; while to Manchester, Liverpool, Leeds, Birmingham, and all our great cities, three times a-week was considered sufficiently frequent. Let the reader imagine, if possible, that these towns in the present day had only a post-office communication with London thrice a-week instead of twice a-day, and that Bath and Tunbridge had their daily post; and it will be felt how great are the changes which have taken place in our social and commercial intercourse since the commencement of the reign of George III. The account from which we quote says:—"Letters are received from all parts of England and Scotland (except Wales) every Monday, Wednesday, and Friday; from Wales every Monday and Friday; and from Kent and the Downs every day." Packets *sailed* twice a-week for France, that is, about as frequently as they now start for America. The 'Great Western,' 'Liverpool,' or 'British Queen,' 'steaming' across the Atlantic in less than a fortnight, would have been as marvellous to the men of 1768 as the railroads. Nevertheless, in that day and generation the arrangements of the post-office were regarded with the utmost complacency. "Letters are conveyed in so short a time, by night as well as by day, that every twenty-four hours the post goes 120 miles; and in five or six days an answer to a letter may be had from a place 300 miles distant from London." At present it is quite possible for a person living at Preston, 221 miles from London, to send a letter to and receive an answer from London in twenty-five hours, allowing too a delay of four hours in London, the distance traversed being 442 miles. In 1768, the mail, travelling at the rate of less than six miles an hour, would have been little more than half-way to Preston in the same time. It is also quite possible, in a case of emergency, for a merchant at Birmingham to write to his correspondent at Liverpool in the afternoon and receive a communication in reply the *same night*, the distance, which is above two hundred miles, being traversed between half-past two and a quarter before twelve, and an hour being allowed at Liverpool.

It is estimated that the number of letters conveyed through the post-offices of England and Wales in a year was about sixty millions, previous to the recent change in the scale of postage; and perhaps the number will very soon exceed two hundred millions, an enormous amount of correspondence, it must be confessed. But when every man and woman in England can write instead of only about one-half of the adult population, even this number will probably be small in comparison with the frequent use which will then be made of the post. But the generation preceding our own conceived that in their time the activity of correspondence by the post had attained a magnitude which would have surprised *their* grandfathers. "Though (says the writer of 1768) the number of letters missive were not at all considerable in our ancestors' days, yet it is now so prodigiously great (since the meanest people have generally learnt to write*), that this revenue amounts to about 110,000*l.* a-year." The postage was at that time 3*d.* for 80 miles, and for distances above 80 miles the charge was 4*d.* Supposing that the average of all letters posted was 3½*d.*, it would appear that the number of letters annually transmitted by the post, not in England and Wales only, but in Great Britain, was 7,500,000. The population has trebled since this period, but we hope soon to see the correspondence by letters increased forty or fifty fold.

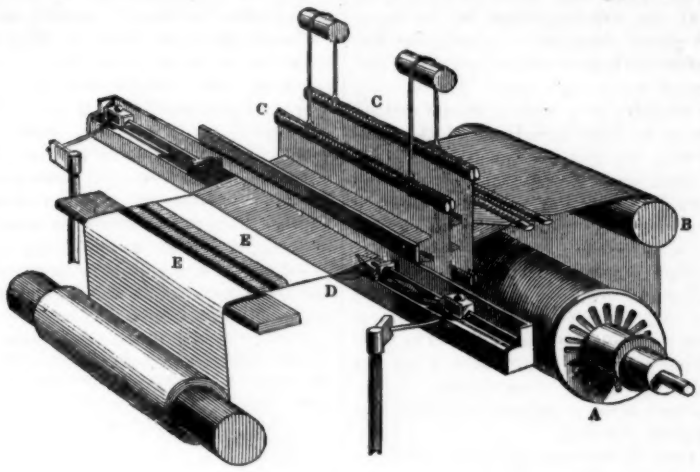
* 'Magnæ Brit. Notitiæ.'

The Rook.—I have spoken of the conjugal affection of the rook. The female takes possession of the nest the moment the building of it commences, and she is attended upon and fed by the male, and with a fondling tremulous voice and fluttering wings, and with more little blandishments than one would think such a bird was capable of expressing, she receives the food which he brings to her; by-and-bye the young are hatched, and perhaps the latter part of the spring is dry, and grubs and wire-worms, and earth-worms, and all the enemies of the farmer—on which, and not on his corn, the rook subsists—are deep in the earth, and beyond his reach; then at the first dawn of light he is seeking the dew-worms, and during the day perambulating the fields and wandering by the side of the hedges and remaining out searching for food quite in the dark, and returning to his roost long after the usual period for retiring, and having fed his brood, himself exhausted and starved, falling from the nest dead under the trees, and others, the only birds with regard to which we have proved this, taking to the broods, and feeding them as well as they can. This bird, with all his interesting qualities, is also a useful one, one of the farmer's best friends. Some corn-seeds, but not many, are occasionally found in his craw; the newly planted potatoes suffer to a certain degree, in his eagerness to get at the grubs with which they are infested. That the food of this bird is the insect, and not the corn, may be easily ascertained. Go into the field in which the ploughman and the sower are both at work, plenty of rooks will generally be found there, but it is the ploughman on whom they attend, and not one particle of the seed is stolen. Time passes on, and the young rooks begin to be able to sit upon the edge of their nests, and they soon wander to the neighbouring boughs, and then a parcel of cowardly fellows congregate together under the trees and shoot as many of them as they can, while the poor old birds are darting about and expressing their grief and soliciting mercy. True, the young rooks are said to be destroyed for food; a portion of them are thus used, but that is not the object of the sportsman, it is murder on the greatest scale on which he can effect it—the murder of one of the most useful birds that our country contains, and that murder committed in view of the parent, and at the period at which the parental affection is most intense.—*Humanity to Brutes, by W. Youatt.*

The 'Naras, a New Fruit.—The 'naras was growing on little knolls of sand; the bushes were about four or five feet high, without leaves, and with opposite thorns on the light and dark green striped branches. The fruit has a coreaceous rind, rough with prickles, is twice the size of an orange, or fifteen or eighteen inches in circumference, and inside it resembles a melon as to seed and to pulp. I seized a half-ripe one and sucked it eagerly for the moisture it contained; but it burned my tongue and palate exceedingly, which does not happen when this most valuable fruit is ripe—it has then a luscious subacid taste. Some plants of 'naras are now growing in England (March, 1838), from seeds which I brought home: they are a foot high and beginning to branch, having two thorns at each articulation, and a stipule scarcely to be called a leaf between them, on the axis of which is a bud, but no leaves.—*Alexander's Expedition of Discovery.*

* This was, unfortunately, an exaggeration

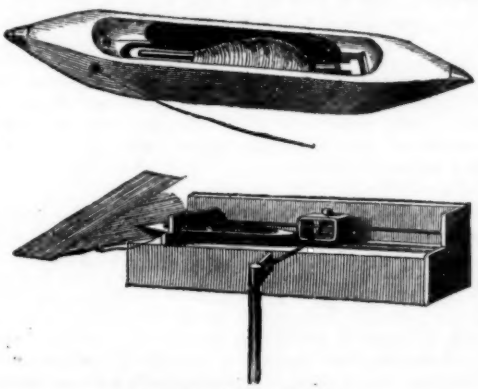
HISTORY OF A COTTON GOWN.—No. III.



[Power-loom.]

Instead of endeavouring to explain all the complexities of a modern loom, we will confine ourselves to that part immediately connected with the throwing of the shuttle. A is a roller round which the parallel threads of warp are wound; these threads pass over another roller B, and pass through the vertical threads of two upright frames C C, called *treddles*. These treddles have the effect of separating the warp into two parcels, one of which is depressed while the other is elevated; the adjoining threads of the warp being alternately depressed and elevated. When the threads advance to the point D, just before they reassemble into one parallel layer, a shuttle (the point of which is just seen under the upper threads) is suddenly driven across from edge to edge of the warp, carrying with it *one thread of weft*, which becomes thus interlaced among the threads of the warp. A piece of mechanism called a *batten* then presses that thread of weft close up to those before made, and which form the completed portion of woven cloth E E. By reversing the motion of the treddles and of the shuttle, another thread of weft is formed in a similar manner, and so on continuously.

The shuttle is a kind of little boat, containing yarn



[Shuttle of Power-loom.]

wound on a spindle. As the shuttle moves onward the spindle revolves and unwinds the yarn, which passes out through a little hole in the boat. The lower half of the adjoining cut shows the mechanism by which the shuttle is driven between the divided threads of the warp.

In making calico, the shuttle of a power-loom generally travels to and fro across the warp about one hundred and twenty times per minute, thus making an equal number of threads of weft in the same time, and a complicated series of movements takes place between each two movements of the shuttle, having for their object to drive up the thread of weft to the cloth already woven, and to reverse the position of the divided parcels of warp, elevating those which were before depressed, and *vice versâ*.

If we examine a piece of calico or of muslin, or the material for a printed cotton gown, we perceive that the threads pass regularly over and under one another, that is, that the cross threads never pass over or under two *adjoining* threads of warp. But if we look at those fabrics which are called *twills*, we perceive a peculiar oblique ribbed appearance; this is caused by a deviation from the mode of weaving just spoken of; after passing under one thread of warp, the weft passes over two, three, four, or even as many as eight adjoining threads, which of necessity imparts a peculiar texture to the fabric. This is one of the means by which the manufacturer multiplies the variety of his goods; for many of the articles which obtain different names at our mercer's and linen-draper's, only differ from each other in the number of threads of warp that the weft passes over after having passed under one thread. In other cases these differences are combined with some peculiarities in the kind or quantity of cotton yarn employed; thus damask, dimity, diaper, fustian, jean, velveteen, corduroy, &c. are all *twills*, and are (some always, others occasionallly) made of cotton. The first three are woven in such a peculiar way, that the twill is made to form a *device* or *pattern*, instead of merely forming a ribbed appearance obliquely across the cloth; the weft, after passing under one thread, goes over from three to seven, according to circumstances, and the opening between the two divisions or parcels of warp is so managed as to lead to the production of a pattern, often very elaborate. The other fabrics we have mentioned are cotton twills, made of stout materials, and having a kind of nap or pile on the surface; this pile is produced by working up and sometimes cutting the loose glossy fibres of the cotton after the weaving is completed.

But these details respecting cotton fabrics generally, nowever interesting, would lead us to too great a length. We must confine ourselves to our cotton gown. The processes hitherto considered have led to the production of a piece of cloth, of a dirty white colour, and devoid of any pattern whatever. If warmth and comfort were the only

objects sought for in clothing, the services of the dress-maker might now immediately succeed those of the manufacturer. But such are not and never have been the limits in this respect; richness of colour and beauty of device have been objects of admiration in every age and country; and the cotton-manufacturer has not neglected to appeal to this taste.

One mode of producing both colour and pattern in woven cloth is to have the threads of the warp of two or more different colours; thus, ten threads white, then ten black, and so on throughout the two or three thousand threads that generally constitute the width of a piece of cloth; a white weft woven in among these would produce a black and white *striped* cotton. If the weft were of two colours, and the warp only one, the stripes would be *across* the cloth. If both warp and weft were variously coloured, a *checquered* pattern would be produced. It will be easy to conceive, from these three instances, how great variety of pattern might be produced when the colours, both of warp and weft, are more than two, and when changes are made in the number of threads which compose each alternation of colour.

But such a plan cannot, without a complexity of weaving apparatus that would lead to costly results, produce *flowers*, *foliage*, *scroll-work*, and similar small patterns. The object of manufacturers, therefore, was to devise the means of laying on a kind of paint or dye, which should impart to white cotton cloth any desirable pattern: if this pattern were only impressed on one side, the inconvenience would not be great, for most garments are seen but on one side. In 1676 a rude mode of impressing patterns on woven cloth was introduced into England from India. Upon this method successive improvements were made, until at length the art has been brought to great excellence. We cannot enter into the extensive subject of *dyeing*, by which a uniform colour is impregnated entirely through the fibres of woven cloth; suffice it to say, that cotton fabrics, like those of wool, &c., are dyed by being dipped into large vats containing colouring liquids.

Let us suppose that the piece of cotton which has engaged our attention, instead of being dyed one uniform colour, is to have a pattern printed on it. The first operation is to *singe* or burn off the loose downy fibres, which would considerably injure the appearance of the cloth if allowed to remain. This singeing is usually effected by passing the cloth with uniform velocity over a very hot iron: the fibres are burned off, but the movement is too quick to allow the cloth to be injured. The cloth is then *bleached* or whitened, for it must be remembered that the natural colour of the fibres, and the many processes they have to go through, impart to cotton cloth a yellowish cast, which is exemplified by the unbleached cotton occasionally received from India: the snowy whiteness of muslins and calicoes is considered an indispensable feature in them; and it is also deemed desirable in cotton about to be printed. The *Bleaching* in our first-rate establishments consists of no fewer than twenty-five distinct processes, and yet a yard of cotton can be bleached for less than one half-penny. But the part of these processes which is the more particularly connected with the removal of colour is that in which *bleaching powder* (chloride of lime) is dissolved in water, and applied to the cloth. One of the constituents of the powder is *chlorine*, a gas possessing the remarkable property of removing colour from almost every class of material, animal, vegetable, or mineral.

Cotton bleaching is the work of one class of persons, cotton or calico printing of another; the cotton to be printed has therefore to pass from the former to the latter. The colours which may be given to the cloth are of infinite variety, and are produced by various substances, such as cochineal, madder, Brazil wood, indigo, Prussian blue, Scheele's green, Saxon green, &c. In elucidation of the manner in which these colours are stamped on the cloth, we may say a word or two respecting *wood-cut* and *copper-plate* printing. *Wood-cuts*, such as those illustrating this article, are printed from wood-blocks on which the figure has been cut, those parts which represent the device being left prominent:—ink is spread on these prominent parts, and an impression obtained from them. But in *copper-plates* the device is *engraved*, that is, the lines which are to form the device are sunk instead of being left prominent; ink is spread over the whole plate, wiped off again from the level surface, and left in the engraved depressions, which impart the device to the paper. Now these processes almost exactly resemble the old and the new methods of calico-printing. According to the old plan, the device was cut upon a block of sycamore, the parts which were to make the impression being left prominent, but when the figure was very fine and complicated, the device was made of small pieces of copper, which were ingeniously driven into the block, and the interstices filled up with felt. In the more modern mode, the device is engraved on a plate or on a cylinder of copper. In the former of the two instances, the flat copper-plate is about a yard square, and after the colour has been applied to its surface, an elastic steel plate is made to pass over it, and remove all the colour from the surface. In the second instance the device is engraved on the surface of a large copper cylinder; and after the colouring and partial removal of colour, the rotation of the cylinder impresses the device upon the cloth, as the latter moves through under the cylinder.

Most of the colours will not remain permanent on the cloth unless the latter be previously dipped into some liquor of a binding quality; such a liquor is called a *mordant*, of which the principal is a solution of alum. This circumstance enables cottons to be printed in several ways. Sometimes the device is printed with an ink (if we may use the term) which is a mordant, and the cloth is then dyed or steeped in some particular colour: on washing the cloth, the whole of the colour washes out, *except* that part where the mordant had been used. In other cases a colouring substance is used, which has the property of uniting with the cloth without the aid of a mordant, but it is prevented from so uniting at some parts by printing a device with some peculiar substance called a *resist paste;* after printing with this resist paste, and then dyeing the whole piece of cotton, washing will remove the dye from those parts touched by the resist paste, but not from the other parts. It is obvious that a *pattern* is produced by both these means, but in a precisely opposite way. The former of the two methods produces a coloured pattern on a white ground; the latter a white pattern on a coloured ground. In either case, however, by a judicious choice of colours, of mordants, and of resist pastes, the whole extent of the cloth may be made to receive various colours, with no portion of white remaining visible.

We will briefly illustrate these remarks by speaking of a blue and white, and a red and white cotton. For the former the device is printed in a resist paste of sulphate of copper; the cloth is then dipped in a blue dye of indigo, and, after some other processes, washed; this washing removes the blue from the printed parts, and leaves them white, thus producing a blue and white pattern. In the second instance the device is printed with an alum mordant, and the piece is then dipped in a dye of *madder* or some similar red: subsequent washing removes the red from all those parts which have *not* been printed with the mordant, and thus a red and white pattern is produced. In the Bandanna cotton handkerchiefs, designed to imitate silk, the cloth is dyed of one uniform colour, and a device of spots formed by removing part of the colour, through a very peculiar application of chlorine, quite different from the process of calico-printing.

We have now manufactured the material for our cotton

gown, by tracing its progress from the state of a woolly fibre, to that of an ornamentally-coloured woven fabric from which garments may be made. The number of processes, the ingenuity employed, the amount of capital invested, the number of workmen, and the impulse given to the export trade of England, render the cotton manufacture of an importance quite unexampled in any other kind of manufacture at home or abroad. Were there not official evidence in support of the fact, it would perhaps be thought incredible that the value of our exports of manufactured cotton equals that of all *our other exports put together:* it is said now to amount to more than twenty-two millions sterling annually. As to the importance of the cotton manufacture in a *social* point of view, we would direct the reader's attention to the following judicious remarks from Mr. Baines:—"If the thought should cross any mind that, after all, the so-much-vaunted genius of our mechanics has been expended in the insignificant object of enabling men better to pick out, arrange, and twist together the fibres of a vegetable wool—that it is for the performance of this minute operation that so many energies have been exhausted, so much capital employed, and such stupendous structures raised, and so vast a population trained up, we reply, our object is not insignificant because the operation by which it is effected is minute. The first want of men in this life, after food, is clothing, and as *this* art enables them to supply it far more easily and cheaply than the old method of manufacturing, and to bring cloths of great elegance and durability within the use of the humble classes, it is an art whose utility is inferior only to that of agriculture. . . . . By supplying one of the great wants of life with a much less expenditure of labour than was formerly needed, it sets at liberty a larger proportion of the population to cultivate literature, sciences, and the fine arts. To this country the new inventions have brought a material accession of wealth and power."

SILK-PRODUCING FISH.

In a previous number of the 'Penny Magazine' (vol. vii., p. 143) details have been given respecting the production of silk by the silk-worm, and of substances closely resembling silk by other insects. A slight allusion was at the same time made to a fish called the *Pinna*, which also produced a kind of silk. The costliness of this latter material has prevented it from attaining a commercial importance, but the circumstances connected with its production are highly deserving of a notice more extended than was compatible with that article.

The pinna belongs to the same order of shell-fish as the well-known muscle, but is very much larger, sometimes attaining so great a length as two feet. The fish is furnished with an organ which serves various purposes at different times. When the animal is about to change place (which is but seldom), the extremity of this organ, which then acts as a leg, is fixed to some solid body, and being then contracted in its length, the whole fish is drawn towards the spot where the end of the organ has been fixed; these movements repeated as often as may be necessary, the animal succeeds in changing its place.

But the more frequent employment of this organ is as a sort of *tongue*, by which the fish spins, or rather moulds, a beautifully fine fibrous substance. The manner in which it acts, according to a late writer on the silk-manufacture, is as follows:—Although the tongue is flat, and somewhat similar in form to a human tongue through the greater part of its length, it becomes cylindrical near the base or root, where it is much smaller than in any other part; at this lower end are several ligatures of a muscular nature, which hold the tongue firmly fixed against the middle of the shell; four of these cords are very apparent, and serve to move the tongue in any direction, according to the wants of the fish. Through the entire length of this tongue there runs a slit, which pierces very deeply into its substance, so as almost to divide it into two longitudinal sections; this slit performs the office of a canal for the liquor of which the threads are formed, and serves to mould them into their proper form; this canal appears externally like a small crack, being almost covered by the flesh from either side, but internally it is much wider, and is surrounded by circular fibres. The channel thus formed extends regularly from the tip to the base of the tongue, where it partakes of the form of the tongue, and becomes cylindrical, forming there a close tube or pipe, in which the canal terminates. The viscid substance is moulded in this tube into the form of a cord, similar to the threads produced from it, but much thicker, and from this tube all the minute fibres issue and disperse. The internal surface of the tube in which the large cord is formed is furnished with glands for the secretion of the peculiar liquor employed in its production, and which liquor is always in great abundance in this muscle.

The *pinnæ* live on the shores of the Mediterranean, usually on sandy banks five or six toises below the level of the sea. They support themselves and their shells in a vertical position, by means of the silken fibres which are protruded in the manner just described. These fibres, called collectively the *byssus*, they attach to any surrounding bodies, or even to grains of sand, in a manner sufficiently firm to enable them to resist the motion of the sea, for they are ill-content with locomotion.

The common edible muscle has the power of producing filaments in a similar way. That they affix themselves to rocks has been long known; but it was not till Reaumur investigated the subject, that it was found how this fixation was attained. He put some muscles into a vessel containing sea-water, and watched their progress. They opened their shells and protruded an organ which we may call a tongue, and moved it about in various directions, as if to find a place whereon to fix itself. After some time one of them was observed to attach the tongue to a particular place, and on drawing it away again with some quickness, Reaumur perceived a very fine thread adhering to the vessel; this, once begun, was repeated several times, until a cluster of fibres was produced. Reaumur afterwards found, that on tearing a muscle away from a rock to which it is attached, it will, if left to itself, speedily repair the damage by spinning some more fibres.

The fibres produced by the muscle are manifestly too short to be woven into a useful fabric; but it appears that the byssus of the larger pinna was early employed for this purpose, as a costly and rare ornament. The word *byssus* is frequently employed in early writings, and it has been supported by some that it was the byssus of the pinna alluded to. It is said that a robe composed of byssus of the pinna was presented to the satraps of Armenia by one of the Roman emperors.

But be this as it may, it is certain that the byssus of the pinna has been employed by the Sicilians for a long time as a material for light clothing. It existed among them more than a century ago, and has continued more or less ever since. The Sicilians not only eat the fish, but make use of the byssus. In order to collect the pinnæ they go out in boats, provided with an iron instrument called a *cramp*, with two prongs or teeth about a foot long projecting from it, and with a handle long enough to reach from the boat to the place where the fish is stationed. The instrument is let down, and the prongs placed beneath the shell, so as to catch it between them. By the muscular force of the man (or sometimes of two or three men) the fish is dragged away from its hold of the rock, by a fracture of the filaments of the byssus, at some part of their length. The fishermen then cut close to the shell those fibres which are sufficiently long for spinning, and these, after being combed or carded,

to remove impurities, are spun into yarn or thread, just as silken filaments would be; and from this yarn are woven or knitted garments of various kinds, such as gloves, stockings, caps, and other light articles. As the filaments of byssus are extremely fine, of a perfectly equal diameter throughout their length, and of some strength, it is found that the fabrics woven from them are supple, strong, and warm; in fact, the combination of extreme lightness with warmth seems to mark this substance in an especial degree.

We must now speak of a circumstance connected with the pinna, which has attracted a great deal of notice among the early naturalists. The pinna is said to be destitute of the organs of sight, and therefore but ill prepared to defend itself from hostile attacks when its shell is open. It is also said to have a deadly foe in the cuttle-fish. Lastly, a little fish of the crab kind has been frequently found sheltered in the shell of the pinna. All these circumstances combined gave rise to much speculation among early naturalists, in which truth appears to have been somewhat confounded with fiction. Aristotle spoke of a little fish with claws like a crab, which keeps guard for the pinna, grows to her mouth, and acts as her caterer. Pliny describes the pinna as a shell-fish that is found in muddy waters, always erect, and never without a companion of the crab kind. Oppianus, a Greek poet, celebrated the friendship of the two fishes in a stanza, which has been thus rendered in English:—

> "The pinna and the crab together dwell,
> For mutual succour, in one common shell:
> They both to gain a livelihood combine;
> That takes the prey, when this has given the sign:
> From hence this crab, above his fellows famed,
> By ancient Greeks was Pinnatores named."

Lamarck has represented the ancients, generally speaking, as having entertained the idea that the pinnatore or crab was the natural sentinel, guardian, companion, and caterer of the pinna; that he took birth with him; that he was essential to the pinna's existence; that the pinna, having no eye-sight, and not much energy of sensation generally, opened his shell in order that small fish might enter; and that the crab advertised him, by a gentle bite, that he had a sufficient quantity, and that he should close his shell; and that they both then shared the booty, the crab having brought eye-sight, and the pinna strength of shell, as their respective contributions to the joint-stock partnership.

Let us now come down to more recent times. In 1749, Hasselquist, the distinguished naturalist, made a voyage to the Levant, and wrote to Linnæus on many of the natural objects which engaged his attention. In one of his letters he says: "Amongst others they sell here (Smyrna) a sepia or cuttle-fish, which by them is called *οκτωποδια*; it has only eight tentacula, all of equal length; the whole animal is a foot long, and thick in proportion. Of this the Greeks have related me an anecdote, which I think remarkable. The Pinna muricata, or great silk muscle, is here found in the bottom of the sea in large quantities, and is a foot long. The cuttle-fish watches the opportunity, when the muscle opens her shell, to creep in it and devour her; but a little crab, which has scarcely any shell, or has at least only a very thin one, lodges constantly in this shell-fish. She pays a good rent, by saving the life of her landlady, for she keeps a constant look out through the aperture of the shell, and on seeing the enemy approach, she begins to stir, when the *πινα* (for so the Greeks call the shell-fish), shuts up her house, and the rapacious animal is excluded. I saw this shell-fish first at the island of Milo, and found such a little crab in all I opened: I wondered not a little what was her business there; but when I came here I was first informed of it by the secretary of our consul, M. Justi, a curious and ingenious man, who has travelled much, and lived long in this place. This was afterwards confirmed by several Greeks, who daily catch and eat both these animals."

But the researches of more recent naturalists, particularly those of France, have led to doubts as to some part of these statements. Some of the details are, in all probability, due to romance, but a recent writer says that the following is a probable version of the real state of the case:—That whenever the pinna ventures to open its shell, it is immediately exposed to the attacks of various of the smaller kinds of fish, which, finding no resistance to their first assaults, acquire boldness and venture in; that the vigilant guard, by a gentle bite, gives notice of this to his companion, who, upon this hint, closes her shell, and having thus shut them in, makes a prey of those who had come to prey upon her,—sharing the booty with her companion. If this be the case, it is sufficiently curious, without venturing into the field of romance.

With respect to the employment of the pinna as a source whence silk might be produced, many naturalists think it might be greatly extended. M. Bosc (*Dict. des Scien. Nat.*) says: "It would seem, from the knowledge we possess, that the capture of the pinna might be regulated, and the product prodigiously increased. A certain number of pinnæ might be caught, not with the cramp, for that generally wounds them mortally, but by severing their byssus. These pinnæ might be placed in ponds of moderate depth, where persons might go from time to time to cut the filaments. Their numbers, as is common with the bivalves, would rapidly increase, and a considerable revenue might be thereby derived. But it is not from people so little industrious and so ignorant as the Calabrians that we must look for improvements in the arts: it is necessary, before they effect such an object, to conquer prejudices and to have a better form of education."

M. de Blainville also thinks that by keeping the pinnæ in ponds they would multiply greatly, and that they could be collected conveniently and at the proper times for cutting off the byssus.

The Paraguay Tea-tree.—The yerba-maté, or tea, is as much in general use and demand throughout all the provinces of La Plata, Chile, and many parts of Peru, as the teas of China are in Europe. The plant which produces it (the Ilex Paraguayensis) is an evergreen of the holly species, about the size of an orange-tree, which grows wild and in great abundance in the dense forests in the northern and eastern parts of the province, whither the people repair yearly in numerous gangs to collect it. The difficulties of penetrating the woods to reach the 'yerbales,' as they are called, are considerable, but they are amply repaid by the certain profits of the adventure. The whole process of preparing and packing it for market is performed on the spot. The tender branches and twigs, being selected, are roasted quickly over a fire till the leaves are crisp; and then, after being partially crushed or pounded, are rammed into hide bags, called 'serrons,' containing 200 lbs. each, which, when sown up, are ready for sale. The Jesuits cultivated the plant, of which there are three species, in their missions; and by attention produced a better quality of tea, called 'caamini,'* than that from the wild plant collected in the woods. From the practice of reducing the leaf nearly to dust probably originated the general custom in South America of sucking the infusion when made through a tube, at one end of which is a strainer, which prevents the small particles of the tea-leaves from getting into the mouth: it is usually made very strong, very hot, and very sweet with sugar; its properties seem to be much the same as those of the China tea. The Spaniards learned to use it from the Guarani Indians. Before Paraguay ceased to be a province subject to the government of Buenos Ayres, eight million pounds of Paraguay tea were annually sent to Santa Fé and Buenos Ayres.—*Sir Woodbine Parish's Buenos Ayres and the Provinces of the Rio de la Plata.*

* The Indians paid their tribute to the crown in this sort of tea

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